MARKING GUIDE

NAME... Index number:................................

Signature:..

545/3
Chemistry
Paper 3
2 Hours

UNNASE MOCK EXAMINATION 2019

Uganda Certificate of Education

CHEMISTRY PRACTICAL

Paper 3

2 hours

INSTRUCTIONS TO CANDIDATES:

- Answer **all** the questions.
- All questions carry equal marks.
- Answers are to be written in the spaces provided ONLY.
- You are not allowed to use any reference books.
- Mathematical tables, slide rulers and non-programmable silent electronic calculators may be used.
- You will be penalized for untidy work.
- Do **not** use a pencil. Use a blue or black pen only

Q.1	Q.2	TOTAL
21	29	50

1

1.You are provided with the following:

BA1, which is a solution of substance Y of unknown concentration.

BA2, which is a 0.2M solution of substance X.

Ethanol

You are required to determine the concentration of Y in moldm^{-3}.

Procedure:

(a). Arrange six test tubes in a test tube rack and label them in order from 1 to 6.

(b). Using a burette, run 10cm^3 of BA1 in each of the test tubes.

(c). Using a 10cm^3 measuring cylinder, add 2cm^3 of BA2 to the test tube labeled 1, followed by 5 drops of ethanol. Hold the mouth of the test tube with your finger, shake vigorously and place the test tube in the rack to settle.

(d). After five minutes, record the height of the precipitate.

(e). Repeat procedure (c) and (d) by adding 3.0, 4.0, 5.0, 6.0 and 7.0 cm^3 of BA2 to the tubes labeled 2, 3, 4, 5 and 6 respectively.

(e). After about five minutes, measure the height of the precipitate in each test tube.

(f). Record the results in the table below.

Table of results:

Test tube number	1	2	3	4	5	6
Volume of BA1 (cm^3)	10.0	10.0	10.0	10.0	10.0	10.0
Volume of BA2 (cm^3)	2.0	3.0	4.0	5.0	6.0	7.0
Height of precipitate (cm)	0.4	0.6	0.9	1.2	1.3	1.3

Ignore if different

(6 marks)

0 6

✓ Values must be written to 1 dp.
The heights must increase then become constant.

Questions:

(a)(i). Plot a graph of height of precipitate against volume of BA2 added.   (6 ½ marks)

- Give ½ for 0.dp's

06½

2

A graph of height of precipitate against Volume of BA2

Scale: Horizontal axis: 1 cm represent 0.3 cm³

Vertical axis: 1 cm represent 0.03 cm.
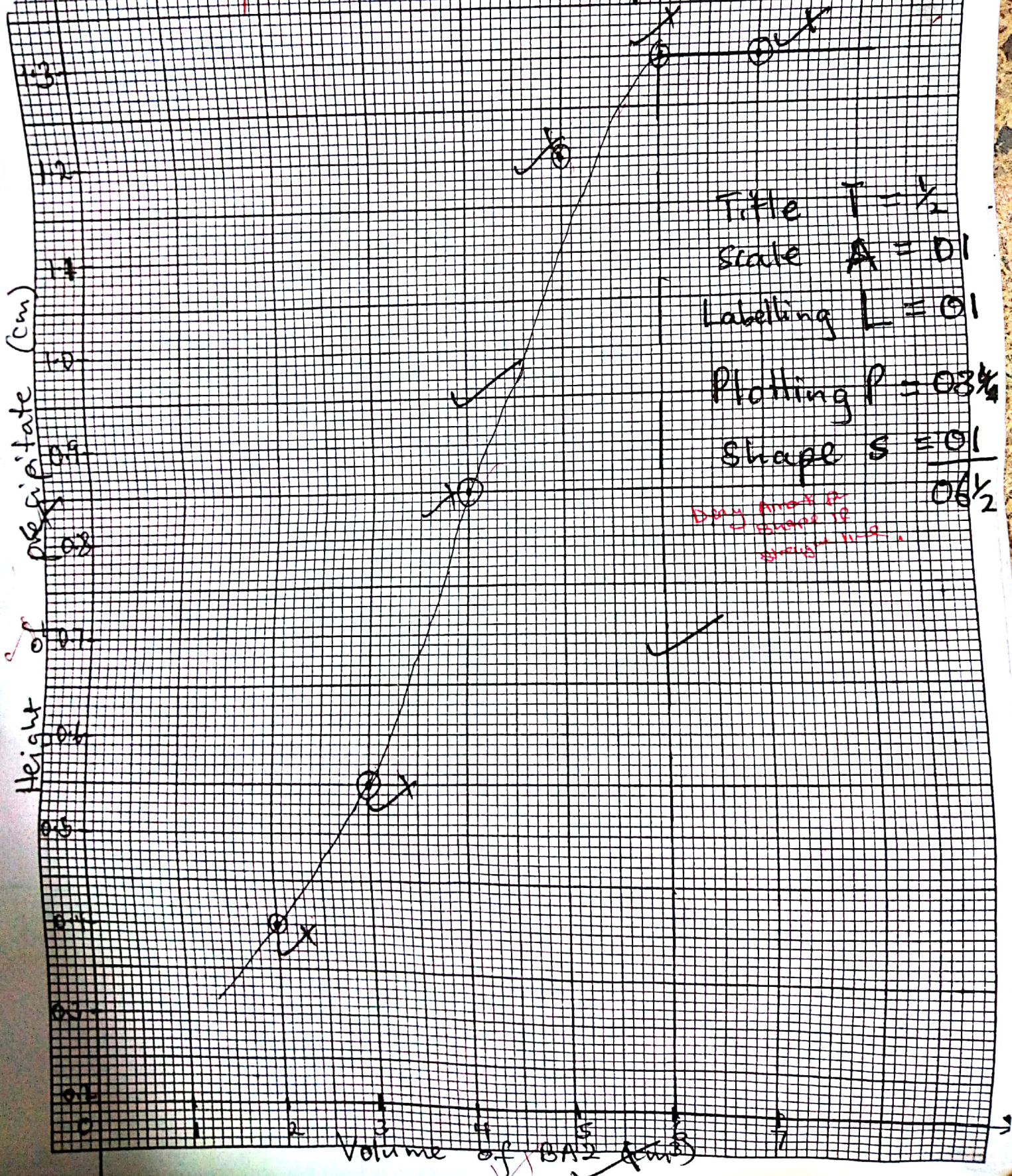
Title T = ½
Scale A = 01
Labelling L = 01
Plotting P = 08½
Shape S = 01
06½

Draw line of shape is straight line

Height of precipitate (cm)

Volume of BA2 (cm³)

(ii). From the graph, determine the volume of BA2 which produces the maximum height of the precipitate.

(2 marks)

Volume of BA2 = 6 cm³ ±.1

1 mark on graph

02

(b). Calculate the;

(i). Number of moles of X that reacted.

(2 marks)

1000 cm³ of BA2 contain 0.2 moles of X

6 cm³ of BA2 contain $\frac{0.2 \times 6}{1000}$ mols of X

02

= 0.0012 mole of X

At least 3dp

(ii). Number of moles of Y that reacted with X.

(2marks)

(1 mole of Y reacts with 1 mole of X)

Since 1 mole of Y react with 1 mole of X

Moles of Y that reacted = 1 × 0.0012

= 0.0012

02

At least 3dp

(c) Determine the concentration of Y in mol dm⁻³.

(2½ marks)

10 cm³ of BA1 contain 0.0012 mole of Y

1000 cm³ of BA1 contain $\frac{0.0012 \times 1000}{10}$ mole of Y

02½

= 0.12 mole of Y

Concentration of Y is 0.12 mol dm⁻³

At least 2d.p

21

3

2. You are provided with substance **Z** which contains **two** cations and **one** anion. Carry out the following tests on Z to identify the cations and anion. Identify any gases evolved. Record your results in the table below.

(20 marks)

TESTS	OBSERVATIONS	DEDUCTION
(a) Heat one spatula endful of **Z** in a dry test tube, first gently then strongly until there is no further change.	white solid Colourless liquid turns white $CuSO_4$ blue ✗ Colourless gas turns blue litmus red ✗ white residue ✗	Al^{3+}, Pb^{2+}, Zn^{2+}, Mg^{2+} or Ca^{2+} Ignore: Zn, Mg or Ca Hydrated salt Max 04½ Acidic gas Al_2O_3, CaO or MgO
(b). To two spatula endfuls of **Z** in a test tube add 5 cm³ of water and shake to dissolve. To the resultant solution add ammonia solution drop-wise until in excess and filter. Keep both the filtrate and residue.	Colourless solution white ppt Insoluble ✗ white residue ✗ Colourless filtrate ✗	Al^{3+}, Pb^{2+} or Mg^{2+} Zn^{2+} 04½
(c). To the filtrate from (b), add dilute nitric acid drop wise until the solution is **just acidic**. Divide the acidic solution into **five** portions	White ppt soluble in acid to form a colourless solution ✗	Zn^{2+} 02
(i). To the **first** portion of the acidic solution, add dilute sodium hydroxide solution drop-wise until in excess.	White ppt soluble in excess to form a colourless solution ✗	Zn^{2+} 02
(ii). To the **second** portion of the acidic solution, add dilute ammonia solution drop-wise until in excess.	white ppt soluble in excess to form a colourless solution ✗	Zn^{2+} Confirmed 02

4

ESTS	OBSERVATIONS	DEDUCTIONS
(iii). To the third portion of the acidic solution, add 2-3 drops lead (ii) nitrate solution	white ppt	SO_4^{2-} or Cl^- 01½ ~~if source~~ dg. deduction. for ~~acr~~ in (v)
(iv). To the fourth portion of the acidic solution, add 2-3 drops silver nitrate solution	No observable Change	Cl^- absent 01
(v). Use the fifth portion of the acidic solution to carry out a test of your own to confirm the anion in Z. Test: Add 3-4 drops of Ba(NO₃)₂ solution	white ppt	SO_4^{2-} confirmed 02
(d) Wash the residue and dry it. Dissolve the residue in a minimum amount of dilute nitric acid. Divide the resultant solution into three portions.	Colourless solution	Al^{3+}, Pb^{2+} or Mg^{2+} 02
(i). To the first portion of the acidic solution, add dilute sodium hydroxide solution drop- wise until in excess.	white ppt soluble in excess to form a colourless solution	Al^{3+} or Pb^{2+} 02½
(ii). To the second portion of the acidic solution, add dilute ammonia solution drop- wise until in excess	White ppt Insoluble in excess	Al^{3+} or Pb^{2+} 02

ESTS	OBSERVATIONS	DEDUCTIONS	
(iii). To the **third** portion of the acidic solution, add 2-3 drops of potassium iodide solution	No observable change ✗	Pb^{2+} ✗ absent Al^{3+} ✗ confirmed	0½

Confirmed in (b)
and (c)(i)

(e) (i) The cations in Z are $\underset{\text{confirmed in (b)}}{Zn^{2+}}$ ✗ and $\underset{\text{confirmed in d(iii)}}{Al^{3+}}$ ✗

(ii) The anion in Z is $\underset{\text{Confirmed in (c)(v)}}{SO_4^{2-}}$ ✗

0½

$\dfrac{}{29}$